Review

Infectious Diseases and Injuries in Child Day Care

Opportunities for Healthier Children

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Objective.—To provide pertinent background information on infectious diseases and injury in child day care and outline measures to address these health care needs.

Design.—We reviewed published English-language literature identified through a MEDLINE bibliographic search, major literature summaries, and bibliographies from identified articles.

Setting.—Child day-care settings reviewed included family child care homes, centers, special facilities for ill children, and facilities for children with special needs.

Patients or Other Participants.—Primarily children in a variety of day-care settings, often compared with children cared for at home.

Main Outcomes.—The occurrence of outbreaks and illness related to infectious disease and injury.

Results.—Compared with preschool-aged children reared at home, among children in day care the risk of some infectious diseases was two to four times greater. Rates of both intentional and unintentional injuries in day-care settings were somewhat lower than those for children cared for at home.

Conclusions.—Because preschool-aged children spend increasing time in structured day-care settings, the risk for some infectious diseases has increased. At the same time, child day-care settings present opportunities for ensuring healthier children through enhanced development, safer environments, better nutrition, increased vaccination coverage, and health promotion.

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RECENT major social and demographic trends have radically altered the structure and function of families in the United States. These trends include the increasing participation of women in the paid work force, rising proportions of single-parent families, and more children living in poverty. One consequence of these trends has been a dramatic change in child-rearing arrangements for young children and an intensified need for child day-care services.[1] About 90% of families with preschool children use full- or part-time child day-care services.

As the need for child day-care services has risen, national attention has focused on quantity, availability, and costs associated with these services. At the same time, however, issues of quality of care—particularly those involving health and safety—have not been addressed adequately. For example, although children can be exposed to unnecessary health or safety risks while in child day care, efforts to develop prevention measures have been constrained by limitations in scientific data on the efficacy, practicality, and cost-effectiveness of alternative strategies.

In this article, we review existing knowledge of two public health issues in child day care—infectious disease and injury. This article provides pertinent background information on infectious diseases and injury in child day care, summarizes basic information about these issues, and outlines measures to address these health needs.

BACKGROUND

Changes in Demographics and Child Day-Care Patterns

In 1988, 60% of children 5 years of age and under (13.3 million children) received child day care.[2] Of these, more than 60% were cared for outside the home, 32.6% in home day care and 31.2% in day-care centers or preschools. More than 80% of the women who work are of childbearing age, and over 90% of these women will become pregnant during the years they are employed outside the home. Since 1970, the proportion of working mothers of children under 5 years of age has risen from approximately 30% to 60%.[1,2] The fastest-growing subgroup of working mothers includes those with

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children under 1 year of age, of whom over 40% are employed.[3] This trend is likely to continue: by the year 2000, more than 75% of mothers with children 5 years of age or under are likely to be working outside the home. Even among children of mothers not currently employed, more than one third had been in a child day-care setting at some time.[2]

Since mothers of preschool-aged children are the fastest-growing segment of the labor force, both the public and private sectors have begun to address the unique work and family issues that concern employers and employees. In particular, the types of child day-care arrangements have proliferated, including those sponsored by corporations, hospitals, and government agencies. The variety of child day-care services now ranges from unregulated in-home child care to licensed child day-care centers (Table 1).[4]

Many companies consider the provision of child-care benefits as an approach to reducing absenteeism and tardiness, decreasing turnover, and enhancing recruitment, morale, and productivity.[5] Employee concerns have increasingly prompted businesses to explore child-care information and referral services, family day care, sick-child care, and before- and after-school programs.

Table 1.—Types of Child Day-Care Settings*

- **Small family child-care home** refers to a private family home in which children receive care (including preschool-aged children of the caregiver). Most state licensing codes limit these to a maximum of six children, and usually licensing is not required.
- **Large family child-care home** usually offers care in a private home serving seven to 12 children (including preschool-aged children of the caregiver) and employs qualified adults. Depending on the state, licensing may or may not be required.
- **Centers** are licensed facilities, usually caring for 13 or more children for full days or parts of days.
- **Special facilities for ill children** care only for sick children.
- **Facilities for children with special needs** usually offer care and education for one or more children with disabilities or chronic illness requiring special surveillance or intervention.

*Adapted from *National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care Programs.*[4]

Costs of Child Day Care

Child day-care costs continue to escalate and now average $3000 per child per year (range, $1500 to $15 000).[6,7] In the United States, 10% of gross income for a family is expended on child day care; a low-income family may expend up to one third of its gross income on child care.[8] Given these costs, it is not surprising that children with annual family incomes of $40 000 or more were more likely than children with family incomes less than $10 000 to ever have received child day care (79% vs 48%).[2]

In addition to costs for routine child day care, each parent may be absent from 1 to 4 weeks annually to care for a sick child.[9-11] Over 60% of employee absenteeism in the workplace may be related to unmet child-care needs, particularly those of sick children; in 1980, 472.1 million days of absenteeism were accounted for by illness or injury.[12] By valuing each day at minimum wage, in 1980, the economic impact of absenteeism associated with illness or injury in a child was $12.7 billion. Because many employers do not routinely grant leave to care for sick children, employees commonly offer other reasons for absenteeism or may use sick days or vacation days to care for their children.[5] Women report two to three times more hours of work lost than men because of family members' illness.[10,12] At the same time, the availability of child day care enables many parents to work, enhancing family income.[14]

Methodologic Concerns

The studies summarized in this article are subject to two limitations. First, because child day-care services in the United States are diverse and evolving rapidly, the results may not be generalizable to day care under different regulatory, enforcement, cultural, or social conditions. Second, in day-care settings having routine surveillance, case ascertainment may be enhanced relative to other settings, resulting in inflated risk estimates.

INFECTIOUS DISEASES IN CHILD DAY CARE

Children who attend day care are at risk for a variety of infectious diseases. For some of these diseases, characteristics of child day-care settings may facilitate transmission of the causative agent(s), increasing the risk that children, members of their households, and day-care staff will become infected. Most of these infectious diseases are mild and self-limiting; however, because they can spread to staff and household members, they may result in loss of work and income. The section below outlines basic considerations regarding the transmission of infectious diseases in child day care, then characterizes these problems in terms of modes of disease transmission.

Factors Associated With Transmission of Infectious Diseases

At least four host- and environment-related factors contribute to person-to-person or airborne transmission of infectious diseases in child day care:

1. Large numbers of children may be in close and direct physical contact.
2. Infants and young toddlers often have poor personal hygiene, are incontinent of feces, and frequently place their hands and other objects in their mouths.
3. Young children are susceptible to a variety of infectious organisms.
4. With many of the diseases caused by these organisms, infected children may be highly contagious before the onset of symptoms, while other problems (eg, hepatitis A and giardiasis) may not be detected because infected children remain asymptomatic.

The risk of transmission of infectious diseases in child day-care settings also may be increased by suboptimal infection-control practices that reflect limitations in staff capabilities and/or facil-

Table 2.—Evidence for the Association Between Various Diseases Transmitted by the Fecal-Oral Route and Attendance at Day-Care Centers in the United States*

Disease/Organism	Outbreaks of Illness		Incidence of Illness, per Child-Year	Prevalence of Infection, %	Estimates of Risk Relative to Care at Home
	No.	Attack Rate, %			
Acute diarrhea (unspecified cause)	>100	<10-100	0.4-4.2	...	1.6-3.5
Giardia lamblia	>25	17-54	0.2-0.4†	7.2-26.0	1.8-12.8†
Cryptosporidium	11	17-64	...	0-27	...
Shigella	14	25-73	...	...	Elevated
Salmonella	2	23-70	...	...	...
Hepatitis A	>100	1-8	...	...	Elevated
Escherichia coli	3	34-56	...	...	...
Clostridium difficile	1	32	...	...	...
Rotavirus	15	44-100	0.2-0.6†	12.4	...

*Among children aged 0 through 36 months. References are available from the authors on request. Ellipses indicate data not available.
†Refers to infection rather than illness.

ities. For example, many day-care centers are not equipped or staffed to care effectively for mildly ill children. These constraints may be compounded by understaffing, low pay for child-care providers, high rates of staff turnover, and lack of adequate training in infection control.

Characterizing the Occurrence of Infectious Diseases

In this section, characterization of the occurrence of infectious diseases in child day care is based on information and data reported from a variety of sources. For example, investigations of outbreaks in child day-care settings have documented the occurrence of some infectious diseases, while descriptive and long-term epidemiologic studies in these settings have provided estimates of the incidence or prevalence of certain diseases. In general, however, these studies have not established estimates of the relative frequency or risk of infectious diseases among children in day care compared with children cared for at home. Such estimates have been provided by community-based comparative studies using case-control, cross-sectional, or prospective methodologies. Although these studies have been limited in scope and design, they have provided the most useful data on risk of infection or disease in day-care centers in comparison with other child-care settings.

In this summary, infectious diseases in child day care are grouped by three principal modes of transmission: (1) person-to-person spread by the fecal-oral route; (2) person-to-person spread by contact with skin, excretions, or bodily fluids; and (3) transmission by aerosols or respiratory droplets. In the United States, few common-source food-borne or waterborne outbreaks have been documented in child day care.

Person-to-Person Spread

Fecal-Oral Transmission.—Infectious agents transmitted by the fecal-oral route have caused cases of both sporadic and outbreak-related illness in day-care settings. These agents include parasites (eg, *Giardia lamblia* and *Cryptosporidium* species), bacteria (eg, *Shigella*, *Salmonella*, and *Campylobacter* species and *Escherichia coli*), and viruses (eg, hepatitis A virus and rotavirus).[15,16] Reports published since the 1970s have helped to characterize the impact of these agents in outbreaks occurring in child day care and to compare the occurrence of the most common enteric infections among children in day care with the occurrence among children cared for at home.

Data from studies in Houston, Tex, indicate that an average of 1.4 to 3.0 outbreaks of diarrhea occur in day-care centers each year.[15,17] Among children attending day care, the estimated incidence of diarrhea ranges from 0.4 to 4.2 episodes per child-year (Table 2).[18-21] Comparative studies indicate that this risk is approximately 1.6 to 3.5 times higher than for children who receive care at home.[20,22,23] However, for children who are cared for in homes other than their own, this risk is nearly equal to that of children cared for at home. For some agents (eg, *Shigella* and *Giardia* species and hepatitis A virus), secondary spread occurs commonly to household members and community contacts of children who attend day care.[24-28]

At least three conditions increase the risk for diarrheal illness among children attending day-care centers. First, children are at greatest risk just after admission to a day-care center.[21,29] Second, diarrheal illness may be more common in centers that care for children who are not toilet-trained or who are less than 2 years of age. Third, children may be at increased risk if they attend a day-care facility in which the same staff person both changes diapers and prepares meals or where diapering or hand-washing practices are not optimal. In contrast, findings from previous studies are inconsistent regarding the role of center size or the gender of the child as a risk factor for diarrhea.

Outbreaks of hepatitis A in day-care centers have been well documented and occur more frequently in centers that are large, provide care to children less than 2 years of age, and are open for longer hours.[25] After hepatitis A virus has been introduced, the risk of transmission within the day-care center increases in relation to the number of children wearing diapers and the degree of mixing between groups of different ages. Substantial transmission outside the day-care environment (eg, to parents) may occur and may account for 70% to 80% of cases.[25] National surveillance data, prospective studies, and outbreak investigations indicate that the risk of acquiring hepatitis A infection appears to be greater for children attending day-care centers; however, there have been no well-controlled comparative studies to quantify the magnitude of this risk.

Hand washing is probably the single most important measure for the prevention of illness caused by enteric pathogens. For example, in day-care centers that have implemented a hand-washing training program, rates of diarrheal illness have declined by 50%[30]; even more important than training, however, is the need for effective monitoring and enforcement of good hand-washing practices.[31] Frequent cleaning and disinfection of surfaces and toys may also be important for some infectious agents, such as hepatitis A virus.

Although transmission of enteric pathogens to other children in the day-care center may be prevented by excluding attendees who have uncontrolled diarrhea, this approach has not been fully evaluated. Moreover, when strict exclusion criteria are enforced in one center, an ill child may be taken to another center with less strict criteria, propagating transmission within the community. Alternatively, reports from some outbreak investigations show that isolation of an affected child (or cohorting of affected children) may limit transmission within the center.[24,32] Prevention of hepatitis A infection requires an additional measure—the prompt administration of immune globulin to those who have had contact with infected children. Finally, the asymptomatic occurrence of many enteric infections (eg, hepatitis A and *Giardia*) among young children complicates the prevention of transmission of agents by the fecal-oral route and underscores the importance of rigorous hand-washing practices in child day-care settings.

Excretions, Body Fluids, and Skin.—*Cytomegalovirus.*—In child day-care settings, cytomegalovirus may be transmitted by direct contact from infected children to susceptible persons, including day-care providers, by infective secretions (primarily urine and saliva).[33,34] The pathogenicity of cytomegalovirus infection is limited among healthy children and adults, and infection with cytomegalovirus is usually asymptomatic. However, in utero transmission can occur, and cytomegalovirus infection can produce serious sequelae. Therefore, the implications of exposure to cytomegalovirus are greatest for women who are pregnant and providing day care to infected children.[34] At present, hand washing—as a general hygienic practice—is the only specific measure that can be recommended for prevention of cytomegalovirus infection in child day care.

Hepatitis B Virus.—Although person-to-person transmission of hepatitis B virus has been documented in some situations of close personal contact, public health surveillance data and epidemiologic investigations suggest that transmission of hepatitis B virus is possible but rare in child day-care settings.[28,35] In particular, the findings in an investigation of one case of acute hepatitis B involving a child attending a day-care center in the United States suggested that infection was associated with being bitten by another child who was a lon-

Table 3.—Studies of the Occurrence of Injury in Child Day-Care Centers in the United States, 1964-1989

Source, y	Location	Design	No. of Centers	No. of Children	Ages	Socioeconomic Status	Injuries*			
							Total No.	Rate per Child per Year	Seeing Physicians	
									No.	Rate per 1000 Children per Year
Center-Based Studies										
Bitner and DeLissovoy,[52] 1964	Hershey, Pa	Record review	1	58	3-4 y	Middle	173	5.1	NA	NA
Solomons et al,[53] 1982	Iowa City	Record review	1	133	2 mo-6 y	Middle	488	0.7	6	9.0
Elardo et al,[54] 1987	Iowa City	Record review	1	133	2 mo-6 y	Middle	1324	2.8	4	8.6
Lee and Bass,[55] 1990	Los Angeles, Calif	Record review	1	400	0-6+ y	Middle	103	0.3	2	5.0
Population-Based Studies										
Landman and Landman,[56] 1987	Maryland	Telephone survey	431	18728	2-6 y	Mixed	29	0.1	18	70.2
Rivara et al,[59] 1989	Puget Sound, Wash	Daily record review	NA	2204	0-4 y	Middle	NA	NA	384	173.0
Chang et al,[57] 1989	Los Angeles	Record review	90	21435	2-5 y	Low	423	0.02	54	2.5
Sacks et al,[58] 1989	Atlanta, Ga	Prospective	71	5390	0-12 y	Mixed	NA	NA	143	27.0

*Injuries are defined differently in the various studies, accounting for some of the variations in rates. NA indicates information not available.

term carrier of the hepatitis B virus.[35] Recommendations for preventing the transmission of hepatitis B virus in day-care centers focus on exposures to contaminated blood or body fluids but also address the needs for educating staff, for hand washing, and for applying appropriate environmental measures.[26]

Human Immunodeficiency Virus.—On the basis of knowledge of the epidemiology of hepatitis B infection, there is a theoretical risk for transmission of human immunodeficiency virus in child day-care settings—specifically, through exposure to contaminated blood or blood-containing fluids.[36,37] However, the level of this risk is considered to be extremely low, and there is no evidence for transmission of human immunodeficiency virus in this setting.[37]

Specific recommendations have been developed regarding the admission to child day care of children infected with human immunodeficiency virus.[37] Other than routine precautions for handling blood and blood-containing body fluids, however, no specific measures have been recommended.[37]

Skin Contact: Lice, Scabies, Ringworm, and Impetigo.—The potential for cutaneous infestations and skin infections in the child day-care setting is suggested by the close contact between children and by reports of such outbreaks among schoolchildren.[38] However, these problems have not been documented extensively in the biomedical literature.

Transmission by Aerosols or Respiratory Droplets

Acute Upper-Respiratory-Tract Illness.—This syndrome is the most common medical problem among children attending day-care centers. By age 2 years, children attending day-care centers have an estimated seven or eight episodes of acute respiratory illness per year,[39,40] an incidence up to 1.6 times greater than among children not attending day-care centers.[39-44] However, the magnitude of this difference is inversely related to duration of time in day care, and the total number of episodes of respiratory illness in preschool-aged children appears to be independent of day-care center attendance.[39,42,45] Therefore, children less than age 2 years who attend day-care centers are more likely to acquire respiratory infections at an earlier age than those cared for at home. The degree to which earlier exposure to respiratory pathogens increases the risk of complications and sequelae (eg, chronic otitis media and hearing loss) is unclear.

Because a broad range of respiratory pathogens may be transmitted in child day-care settings, the epidemiology of problems associated with respiratory or aerosol spread routes are less clearly defined than for pathogens transmitted by the fecal-oral route. However, several respiratory viruses (in particular, respiratory syncytial virus, parainfluenza, adenovirus, enterovirus, and rhinovirus) occur commonly in the child day-care setting and together may account for nearly one third of all respiratory illness in day-care centers.[44]

Nasopharyngeal carriage of bacterial pathogens may be more common in day-care centers than in other settings; three of these (ie, *Streptococcus pneumoniae, Haemophilus influenzae,* and group A *Streptococcus*) have been isolated from 22% to 52% of day-care center attendees with respiratory illness.[45] In addition, outbreaks of tuberculosis have been reported in at least two family day-care homes.[46,47]

Data regarding the comparative risks of some vaccine-preventable diseases (ie, measles, mumps, pertussis, and rubella) among children attending day care and those participating in other types of child-care arrangements are limited. Although transmission within day-care centers has contributed to sustained outbreaks of measles, day-care centers have been considered the primary setting of measles outbreaks in only 1% of cases in the United States.[45] In most states, because state regulations require vaccination of attendees of licensed day-care centers, percentages of children vaccinated are generally higher for those children than for children not in licensed day care.

Because many children and adults with respiratory illness may be infectious before the onset of symptoms, prevention of these problems in child day-care settings is difficult. Moreover, even though aerosols and respiratory droplets are the major modes of spread, fomites and person-to-person contact may contribute to transmission of respiratory pathogens. Because of these considerations, most factors associated with the occurrence of acute respiratory illness in child day care cannot be modified substantially. Hand washing and regular disinfection of toys and other possible fomites are two potential measures for reducing transmission of respiratory pathogens in the child day-care environment. In addition, ensuring that all children are vaccinated against vaccine-preventable diseases is essential. The importance of this strategy may also increase as additional vaccines against other respiratory pathogens are developed. Finally, the resurgence of tuberculosis in certain areas underscores the need for child day-care and health-care providers to be knowledgeable about the need for screening in high-risk populations.

Otitis Media.—In the United States and other industrialized countries, acute otitis media affecting children is a common problem following acute upper-respiratory-tract infections. Epidemiologic and clinical studies have increasingly suggested that children attending day care are at greater risk for acute otitis media than children in home care.[45-49]

In general, otitis media results as a bacterial complication of antecedent upper-respiratory-tract viral infections; the most commonly implicated bacterial pathogens include *S pneumoniae* and nontypeable *H influenzae*. Efforts to develop agent-specific vaccines offer some prospects for prevention of otitis media in the future. However, current options are limited and rely on fundamental infection-control measures, including hand washing and basic environmental hygiene.

Meningitis.—Although many children may be nasopharyngeal carriers of *H influenzae* type b, the risks of meningitis and other invasive clinical diseases in these children have not been clearly established. However, attendance at organized day care is considered to be a risk factor for primary invasive *H influenzae* type b disease[50]; this risk is inversely proportionate to age and is highest for children less than age 2 years, probably reflecting increased exposure to infectious respiratory secretions. Less clear is whether day-care attendance is associated with an increased risk for secondary *H influenzae* type b disease. *Neisseria meningitidis* also causes meningitis in the day-care setting, but the risk associated with attendance at day care is unknown.

The recent availability of effective *H influenzae* type b conjugate vaccines offers prospects for dramatically reducing the overall occurrence of meningitis and other invasive *H influenzae* type b disease as well as the occurrence of these problems in child day care.[51] Accordingly, efforts to prevent primary invasive *H influenzae* type b disease should be directed toward implementing the recommendation that all children receive one of the conjugate vaccines licensed for infant use beginning routinely at age 2 months.[51]

INJURY IN CHILD DAY CARE

Methods used to characterize the epidemiology of injury in child day care have included studies focused on individual day-care centers, population-based studies, prospective studies, ongoing surveillance, and studies of case series and registries. The section below summarizes data regarding the epidemiology of and risk factors for both intentional and unintentional injury in child day care.

Injury Occurrence

Rates of injury in child day care vary in relation to several factors, including location, demographics, type of child care, definition of injury, data sources, and study design. One approach to estimating the risk of injury has been to focus on individual child day-care settings. In four such studies involving record reviews of university-based child day care,[52-55] annual injury rates ranged from 0.7 to 5.1 injuries per child (Table 3). In one day-care center, during a 42-month period, almost 90% of attendees were involved in incidents that were judged by the staff to require documentation[54]; virtually all of these injuries involved either the head (73%) or limbs (23%), and 96% of the injured children were treated adequately by washing, application of ice, and attention from adults. In general, the most common injuries were abrasions and swellings involving the head and limbs, usually secondary to falls.

Population-based estimates of the risk of injury have been derived from telephone surveys, record reviews, and prospective case ascertainment (Table 3).[56-59] In addition to estimating risk of occurrence, these studies have provided estimates of the need for medical evaluation. For example, a telephone survey in Maryland suggested that 7% of children in day care required medical attention for injuries and that 4% required activity restriction because of the injuries.[56]

Rates of injury for children in day care are somewhat lower than those for children in the general population. Among a group of 1199 children less than age 5 years enrolled in a health maintenance organization, prospective monitoring indicated that the rate of injuries in day care was 2.5 per 100 000 child-hours of exposure compared with 4.9 per 100 000 child-hours of exposure in the home environment.[59] A national telephone survey regarding health events in child day care found a rate of injury during child day care of 1.7 per 100 000 child-hours of exposure compared with 2.7 per 100 000 child-hours of exposure at home.[60]

Rates of injury in child day care vary by age, although the age of highest incidence varies among studies.[52,53,55,57-59] Rates of injury peak at about 11 AM and again at 4 PM and vary by season, with the highest rates occurring in summer and spring; seasonal rates have also varied by age of the child. The playground was the most frequent site of injury.[54,56-58]

Human bites are an underrecognized problem associated with the congregation of large numbers of preschool-aged children in child day care.[61,62] For example, in one retrospective cohort study, 104 (46%) of 224 children enrolled in a day-care center for 1 or more days during a 12-month period incurred at least one human bite.[61] In this day-care center—which served a white, middle-class population—a male toddler was likely to be bitten nine times if enrolled full-time. The risk for being bitten was increased during the middle of the morning and in September, the opening month for a center operating only during the school year. In the absence of comparative data from children in other settings, however, the relative risk of bite injuries is not clear.

Child Abuse

Although a theoretical basis for maltreatment of children by staff has been suggested,[63] epidemiologic data regarding intentional injury (caused by staff or children) in day-care settings are limited. For example, in 1985-1986, 6005 reports of physical abuse and 2372 cases of sexual abuse were confirmed statewide in the Iowa Child Abuse Registry[64]; of these, only two reports involved child day-care centers. However, other reports have indicated the occurrence of physical and sexual abuse that requires appropriate clinical and supportive intervention.[65,66]

In North Carolina, the complaint log maintained by the Office of Child Day Care Licensing recorded 424 complaints during the year ending in mid-1983.[67] Although most complaints related to licensing (45%) or to violations of basic standards, such as staff-child ratios (39%), approximately 17% were allegations of abuse or neglect (of which fewer than one third led to "strong" interventions). Complaints against unregistered homes were three times as likely to be judged severe as those against registered homes, and day-care centers meeting only minimum licensing standards were five times more likely to have a severe complaint than those meeting higher standards.

Potential cases of sexual abuse associated with child day care were identified through a survey of licensing and child-protection officials in all 50 states, through contact with 48 clinicians specializing in sexual abuse, and through a search of newspaper articles.[68] For the 3-year period ending in December 1985, 1639 victimized children were identified in 270 facilities. Adjusting for missing data, the authors estimated an annual rate of 5.5 sexually abused children per 10 000 enrolled in day-care centers (not

family day-care homes), a rate lower than national figures of 8.9 per 10 000 for children less than age 6 years in families.[68] Most cases (83%) involved a single perpetrator in an isolated setting, such as a bathroom; the perpetrator was a child-care worker in 62% of cases and was usually a man (60%). In half the instances there was a single victim, usually a girl (62%). No useful predictors were found to identify perpetrators, victims, or centers. Indeed, usual indicators of day-care quality were not associated with low risk, although facilities where parents had ready access to their children were less likely to have cases of sexual abuse.

Prevention

The occurrence of injury among children in day-care settings underscores the opportunities and needs for specific measures to prevent this problem. Because playgrounds are common sites for injuries,[54,56,57] preventive efforts have focused on playground apparatus and, in particular, impact-absorbing surfaces under climbing equipment.[69-71] One study of injury hazards in home day-care facilities indicated that 29% of indoor and playground items were unsafe.[72] In particular, knives and other sharp objects were accessible to children in the kitchens in 69% of homes, cleaning supplies in 35%, and hot-water temperatures in excess of 49°C in 69%. Moreover, 89% of outdoor playgrounds had climbing equipment without energy-absorbing material underneath.

These findings are a reminder that playground-related injuries can be addressed effectively through methods such as the exclusion of high-risk apparatus (eg, climbers), installation of impact-absorbing surfaces, and increased supervision at times of highest risk. Investigators in a study of 66 Atlanta child day-care centers demonstrated that the risk of injury was proportionate to the number of playground hazards and recommended the development and enforcement of effective regulation of playground equipment at these centers.[73] Educational efforts to significantly reduce hazards in these settings, however, have had limited success.[74]

In general, parents in the United States are not well informed about risks of injury to their children who attend day care; parents of lower economic status are particularly poorly informed.[75] Moreover, even well-educated employees of one health care institution tolerated unsafe features in day-care centers,[76] and only 11% of these parents considered safety when choosing a day-care facility.

Child day care is an excellent and efficient opportunity for educating children and providers about the prevention of intentional and unintentional injuries, not only in day-care settings but also in the home. For example, an educational curriculum for increasing safety-seat and seat-belt use in preschool programs in Los Angeles, Calif, increased the use of safety restraints from 22% to 44% two weeks after the curriculum was completed, while no change occurred in programs without the curriculum.[77] A subsequent decrease in the use of safety restraints suggested the need for continuing educational reinforcement. Evaluation of a program to train child day-care personnel in addressing child abuse suggested that a special training course had *minimal* impact on staff participation in intervention activities or on the development of adequate written policies for the management of child abuse.[78] However, programs with personnel receiving special training were more likely to be involved in prevention activities to utilize community referral resources for high-risk families.

COMMENT

Since the early 1970s, dramatic social and economic changes have led to the emergence of child day care as an integral component of the social fabric in the United States, with major implications for the practice of medicine. Because children are spending substantially more time in structured settings with other children, their risk for many infectious diseases has increased. On the other hand, child day-care settings represent opportunities for ensuring healthier children in the United States through enhanced development, safer environment, better nutrition, increased coverage with vaccination, and health promotion.

Physicians and other health care professionals should join with parents, public health organizations, and others at the forefront of a reasoned and rapid national response to the changes brought on by child day care. The recent publication of the health and safety standards developed jointly by the American Academy of Pediatrics and the American Public Health Association was an important early step in addressing this need.[4] Primary care providers—especially pediatricians and family physicians—must recognize not only the health and safety issues related to child day care but also their critical role and the impact of child day care on child development (cognitive and behavioral).[79] Members of racial and ethnic minorities or children with special needs, such as those with disabilities, may require particular attention in regard to day-care needs. Physicians who provide care to adults must be sensitive to the health impact of child day care on day-care workers, who are at higher risk of infectious diseases, and parents, who are subject to stress from the dual responsibilities of work and parenting.

Finally, clinicians and public health departments play a critical role in the assurance of quality in child-care settings through disease and injury control and by health promotion through training and education of parents, staff, and children.

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